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POSSIBLE IMPACT OF COSTS OF SELECTED POLLUTION CONTROL EQUIPMENT ON THE ELECTRIC UTILITY INDUSTRY AND CERTAIN POWER INTENSIVE CONSUMER INDUSTRIES

EXECUTIVE SUMMARY

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IRWIN M. STELZER
PRESIDENT

January 5, 1972

Mr. Hoff Stauffer
Council on Environmental
Quality
722 Jackson Place, N.W.
Washington, D. C. 20006

Dear Mr. Stauffer:

Attached hereto is an Executive Summary of our report, "Possible Impact of Costs of Selected Pollution Control Equipment on the Electric Utility Industry and Certain Power Intensive Consumer Industries," prepared pursuant to our contract of September 24, 1971.

As noted in the transmittal letter accompanying the report, the calculations therein are based on data and assumptions provided by the Environmental Protection Agency. While we could, in some instances, refine those data and assumptions so that they more closely reflect the situation in the electric utility industry, in other cases, limits of time, budget and data required us to accept without independent verification the data provided to us by EPA under the terms of the contract.

If you have any questions concerning the contents of this Summary, please do not hesitate to call us.

Very truly yours,

NATIONAL ECONOMIC RESEARCH
ASSOCIATES, INC.

By: Irwin M. Stelzer
Irwin M. Stelzer
President

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Attachment

EXECUTIVE SUMMARY

This report is one of a series of twelve, covering different industries, being submitted by different contractors to the Council on Environmental Quality under parallel contracts. It should be understood that, because of fundamental differences in the characteristics of the electric utility industry, which provides a service, and those of the other industries, which are producers of manufactured products, much of the standardized topical outline and scope specified by the Council is inapplicable or irrelevant to this report.

Discussion of the impact of pollution controls on the electric utility industry requires a general understanding of the demand-supply relationships in the industry, the characteristics peculiar to the generation, sale and use of electricity, and the regulatory aspects of the industry. In the unregulated sectors of the economy we rely on competition to eliminate supernormal profits and to force firms to be efficient in serving customers. In the electric utility industry, in contrast, governmental regulation aims to accomplish these same results by focusing on certain variables such as the rate of return on invested capital and customer service quality. This regulation falls into six different areas:

1. "Utility type" regulation done through public service commissions at state or local levels.

2. Federal Power Commission regulation of the wholesale rates charged by private utilities and of interconnections, provision of wholesale services and reliability standards.

3. Atomic Energy Commission regulation through the licensing of nuclear power plants and the monitoring of health and safety standards for radiation levels.

4. Antitrust regulation by the Justice Department and by the Securities and Exchange Commission under the Public Utility Holding Company Act.

5. Federal Power Commission and Securities and Exchange Commission regulation of the industry's financing activities.

6. Environmental regulation, a new area since the Calvert Cliffs decision,[1/] which requires the Atomic Energy Commission to insure that the letter and spirit of the Environmental Protection Act is carried out in the construction of nuclear power plants.

The significance of this comprehensive governmental regulation of the electric utility industry in the present context is that cost impacts, such as those arising from pollution controls, do not depend on the free play of economic forces but on administrative decision making. In the philosophy of utility regulation, justified cost increases are passed on

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1/ Calvert Cliffs' Coordinating Committee, Inc. et. al. v. United States Atomic Energy Commission and United States of America, No. 24,839 (D.C. Cir., July 23, 1971).

to the consumer. It may well be, however, that in a given instance the regulator may determine that the increased costs should be in some measure shared by the stockholder and ratepayer, in which case the cost increase is not wholly passed on. And even if all costs are passed on, the customer groups affected will vary from one jurisdiction to the next. The passing on, moreover, whether in whole or in part, is likely to occur some time after the initial incurrence of the costs because of the delay inherent in the regulatory system. We wish to emphasize, therefore, that administrative judgment and regulatory lag are major determinants of both the size and nature of the ultimate impact of higher electricity costs.

A. Demand Characteristics

The aggregate demand for energy in the United States increased at a compounded annual rate of 4.4 per cent during the 1960s, whereas aggregate demand for energy in the form of electricity increased at a rate of 7.3 per cent. A determination of projected growth rates for the future is a most difficult chore to which we have devoted our attention in other studies. It is made even more difficult by the changing relationship of energy growth to economic growth, as measured by Gross National Product, in recent years. The ratio of aggregate energy consumption to Gross National Product (the energy/GNP ratio) underwent a long-term secular decline during the period 1947-1966, following a trend that began in the 1920s. Since 1966, however, the trend has reversed, and the ratio has shown an uninterrupted increase. If the trend prior to 1966 had

persisted, energy consumption in 1970 would have been lower by an amount greater than the total electric utility consumption of coal in that year. An analysis of the possible reasons for this trend reversal indicates that it cannot be ascribed to any single cause but that a major part of it is apparently the result of: (1) the increasing relative importance of nonenergy uses of the fuels, (2) a tapering off in the year-to-year improvement in thermal efficiency at central power stations, and (3) the increasing relative importance of air conditioning and electric heating. The net result of these factors is a tendency toward a sustained high growth rate in aggregate energy consumption and a consequent increase in the energy/GNP ratio except in years of high GNP growth rate (i.e., when GNP growth is sufficiently high to exceed the growth in energy consumption).

These considerations plus others too numerous to mention here lead us to the conclusion that there is no reason to think that the recent growth rates will be altered in the next five years or so. We therefore feel it is reasonable for present purposes to concur in the Federal Power Commission forecast that electricity consumption will continue to grow at a doubling rate of ten years (i.e., at 7.2 per cent per year) during the 1970s.

B. Elasticity of Demand for Electricity

Several studies have been made of the elasticity of electricity demand. We had occasion within the past two years to review them critically and concluded that because of

deficiencies in the underlying data, none of the studies could be considered to have yielded a satisfactory measurement. We assume for purposes of this report that the demand for electricity is relatively inelastic, despite the possibilities for substitution between electricity and the fuels, for the following reasons: (1) natural gas supply will be insufficient relative to potential demand throughout the period of the study (1972-1976), and (2) pollution controls will be applied to other energy sources as well, affecting their costs.

C. Assumptions Used in Calculating Costs

The following assumptions were used in computing the cost of controlling thermal pollution by mechanical draft cooling towers and the cost of controlling air pollution by wet limestone scrubbers.

1. Sulfur emission problems are restricted to coal- and oil-fired power plants.

2. As given by EPA, all coal- and oil-fired plants of less than 200-megawatt capacity and all those which operate at a 30 per cent or lower plant factor will meet pollution standards using low-sulfur fuel.

3. Plants which generate less than 50 per cent of their output from coal or oil will also meet pollution standards through the use of low-sulfur fuel.

4. As given by EPA, all coal- and oil-fired plants of greater than 200-megawatt capacity and operating at more than 30 per cent plant factor will install wet limestone scrubbing processes.

5. As given by EPA, investment costs for wet limestone scrubbing are $30 per kilowatt.[2/] EPA assumes that costs of retrofitting and new installations will be the same. Our modified assumption, which we believe to be more realistic, is that investment costs for retrofitting will be more on the order of twice that of new installations.[3/]

6. We assume that operating costs of .35 mills per kilowatt-hour for the limestone scrubbing represent a bare minimum which can be used for these purposes.[4/]

7. As given by EPA, existing facilities will be brought up to standards through the following phasing: 1972 - 5 per cent; 1973 - 10 per cent; 1974 - 35 per cent; 1975 - 40 per cent and 1976 - 10 per cent.

8. We assumed that installed new generating capacity for the 1972-1976 period will be according to the listing in the National Coal Association's Steam Electric Plant Factors, 1970 Edition.

9. We also assumed that any addition with coal- or oil-burning capability will require installation of air pollution control devices.

2/ We believe that this figure represents an underestimate.

3/ This does not mean that we deem the other assumptions, e.g., 7, to be realistic; appraisal of each would be a study in itself.

4/ This excludes costs of calcium sulfate disposal which may well equal the total cost of sulfur removal itself.

10. As given by EPA, all thermal capacity will require cooling towers by the end of 1976.

11. As given by EPA, cooling tower costs are:

a. investment costs--$7 per kilowatt

b. operating costs--.05 mills per kilowatt-hour

c. thermal loss cost--150 Btu per kilowatt-hour

12. As given by EPA, the costs of retrofitting an existing plant or modifying a new plant are the same. As in assumption 5, we believe this is unrealistic and here, too, assumed a doubling of investment costs for retrofitting.

D. Cost Increases as a Per Cent of 1970 Average Revenues

In Part III, Table XIII, we present the end result of our computations, by region, concerning the cost of air and water pollution control equipment. On the basis of the above assumptions, by 1976 the costs of installing wet limestone scrubbing equipment and mechanical draft cooling towers will amount to about 7 per cent of current average revenue levels. There are, however, wide regional variations around this figure.

E. Effect on Consumer Industries

We cannot emphasize too strongly that the effects of increased costs in electricity generation are highly indeterminate. The pass-through of these increased costs depends, as noted above, on how the costs are treated by regulatory commissions. And, even if the costs are passed through promptly and in their entirety, the impact of the

pass-through will depend on the rate structure and the manner in which increases are treated in that structure. For example, the regulatory commission could approve a rate structure which passed through the cost increases entirely to commercial and residential customers, in which case industrial customers would feel no impact whatsoever.

Because of (1) this uncertainty surrounding the manner in which aggregate cost increases will be translated into specific prices, (2) the above-described unsatisfactory nature of our knowledge of demand elasticity for electric use, and (3) the limited scope of our assignment, we do not present a specific, industry-by-industry analysis of the effect of the cost increase on consumer industries. We do note, however, that our own studies indicate that the impact of these costs on consumption is likely to be small. This stems from the fact that very few industries have electricity costs that amount to more than a few percentage points of the total value of their products. In fact, in only six industries does electricity cost account for more than 5 per cent of the total value of shipments.[5/] Because of the small place of electricity costs in total industrial costs, the elasticity of demand for final products would have to be extremely high in order to

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5/ These six industries are: primary aluminum, industrial gases, hydraulic cement, chloralkalies, electrometallurgical products, and gaseous diffusion (uranium enrichment). (U.S. Bureau of the Census, 1967 Census of Manufactures). The power intensities of these industries are given in Part III, Table XV.

yield an elastic demand for electricity by industry. Thus, the presumption is that industrial demand is generally inelastic, which is the same as saying that the results of passing through to industry cost increases in electricity generation would be small.

Whatever the size of the impact, it will tend to vary regionally, since industrial demands for electricity vary by region, with the most power intensive industries located in the Far West (excluding California) and the area serviced by the Tennessee Valley Authority. The former has relatively cheap electric power because of its large hydro facilities and the latter because of the subsidized nature of TVA. Hydropower in the West will not be affected by air and water pollution standards, but since TVA is now using coal in almost 80 per cent of its generating facilities, it will be affected by these standards. Moreover, since its rates are among the lowest in the United States, its customers will experience one of the largest percentage increases.

F. Employment Effect of Pollution Controls

The electric utility industry and the six industries which are most power intensive are all extremely capital intensive. As shown in Part II, Table XI, in 1970 investor-owned utilities employed 384,900 workers, which constituted only 0.4 per cent of the United States labor force. Of these 384,900 workers, 94,700, or almost 25 per cent, are construction workers who would not be affected by any plant dislocation

(if this were possible in the electric utility industry). The six large user industries employed only 177,500 workers in 1967, or slightly more than 0.2 per cent of the total United States labor force in that year. On a national level, therefore, even if there were dislocations caused by increased cost of electricity due to pollution controls, there would be no significant changes in total United States employment.

G. Conclusions

We conclude, under the assumptions listed above, including our modifications thereto, that the price of electricity would rise for the reasons above by about 7 per cent by 1976. There would be no significant dislocation within the electric utility industry and such dislocation within the industry at large would be unlikely. Even if there were to be dislocations among the six most energy intensive industries the employment effects would be minimal in terms of total United States employment.

H. Further Pollution Abatement Costs That Have Not Been Discussed

Elimination of thermal pollution and sulfur oxide pollution are not the only areas of pollution abatement that may be required of the electric utility industry in the future. There is a body of opinion which holds that the truly important air pollutants are the nitrogen oxides. Comparatively little work has been done to date on the parameters governing NO_x formation in combustion, and even less on means of avoiding NO_x production.

A second area is radiation release. Current standards are a subject of controversy, and it is possible that more severe standards could require larger investment costs for nuclear power plants.